

REMARKS

This Amendment is responsive to the Office Action dated October 16, 2008. Applicant has added claims 66–69. Claims 1–10, 12–27, 29–43, 45–51, and 53–69 will be pending upon entry of this Amendment.

Claim Rejection Under 35 U.S.C. § 103(a)

In the Office Action, claims 1–10, 12–27, 29–43, 45–51, and 53–65 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kotowski et al. (U.S. Patent No. 6,055,168, hereinafter referred to as “Kotowski”) in view of Lebel et al. (U.S. Patent Application No. 2003/0065370, herein referred to as “Lebel”). Applicant respectfully traverses the rejection. The applied references fail to disclose or suggest the inventions defined by Applicant’s claims, and provide no teaching that would have suggested the desirability of modification to arrive at the claimed invention.

In support of the rejection of independent claims 1, 18, 35, 51, 60, 62, and 64, the Office Action stated that Kotowski discloses a boost converter to convert a battery voltage to an operating voltage and a control circuit to inhibit pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.¹ The Office Action reasoned that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Kotowski by providing the voltage converter to a handheld programmer having an internal antenna in combination with a neurostimulator because Lebel teaches a handheld programmer that utilizes a boost converter.² Applicant respectfully disagrees with the Office Action’s conclusion of obviousness.

Kotowski describes a switched capacitor circuit that receives an unregulated voltage (e.g., from a battery) and outputs a regulated voltage to an electronic device or load.³ The gain of the switched capacitor circuit is selected based on a desired output voltage or load current and must also be greater than a minimum gain needed to ensure that the desired output voltage is met or

¹ Office Action dated 10/16/08 at p. 3, item 5.

² *Id.* at pp. 3–4, item 5.

³ Kotowski at col. 3, ll. 10–19.

exceeded.⁴ The minimum gain is determined based on the input voltage of the switched capacitor circuit.⁵

Kotowski also discloses a comparator that compares the output voltage of the switched capacitor circuit to the desired output.⁶ According to Kotowski, if the output voltage is less than the desired output, the comparator sends a “pump” signal to the switched capacitor circuit to indicate that more current is needed.⁷ In response to receiving the “pump” signal, the switched capacitor circuit maintains the frequency of clock pulses, i.e., does not skip a clock pulse.⁸ If the output voltage is greater than or equal to the desired output, the comparator sends a skip signal to the switched capacitor circuit to indicate that the output voltage is sufficient and the switched capacitor circuit should not transfer any more charge to the output. i.e., the switched capacitor circuit should skip a clock pulse.⁹

According to Kotowski, the gain of the switched capacitor circuit is based on the trend of the output voltages.¹⁰ For example, if a consecutive number of “pump” signals are detected, the gain is increased. Likewise, if a consecutive number of “skip” signals are detected, the gain is decreased. Regardless of the number of consecutive “skip” signals, the gain is not allowed to decrease below a minimum gain. According to Kotowski, the minimum gain is the minimum gain needed to ensure that the desired output voltage is met or exceeded. The value of the minimum gain is based on the voltage input into the switched array circuit, the desired output voltage, and the gain configurations allowed by the switched array circuit.¹¹

The Office Action reasoned that because Kotowski discloses that an “input (battery) voltage is used to select the gain based on a number of thresholds” and “the gain is used to inhibit pulse skipping,” Kotowski discloses pulse skipping that is inhibited when the battery voltage exceeds an arbitrary threshold voltage.¹² Applicant respectfully disagrees with this analysis. As an initial matter, while Kotowski discloses that an input voltage is used to select a

⁴ *Id.* at col. 3, ll. 1-5.

⁵ *Id.* at col. 3, l. 9 to col. 4, l. 8.

⁶ *Id.* at col. 3, ll. 36-55.

⁷ *Id.* at col. 3, ll. 26-30.

⁸ *Id.*

⁹ *Id.* at col. 3, ll. 19-35.

¹⁰ *Id.* at col. 3, ll. 36-44.

¹¹ *Id.* at col. 3, ll. 60-65.

¹² Office Action dated 10/16/08 at p. 3, item 5.

minimum gain, Kotowski does not disclose or suggest that any other gain settings, such as gain settings that are used to determine the output voltage, are selected based on the input voltage. Kotowski discloses that the gain settings used to determine the output voltage are selected based on the trend of the output voltages.¹³ For example, as discussed above, Kotowski discloses that if a consecutive number of “pump” signals are detected, the gain is increased. The minimum gain is merely used as a floor below which the gain is not allowed to decrease.¹⁴ Thus, the Office Action’s assertion that Kotowski discloses that a battery voltage is used to select gain is only partially correct.

Moreover, Kotowski does not disclose or suggest that pulse skipping is inhibited based on a level of a battery voltage, as required by claim 1. The Office Action stated that in Kotowski, “pulse skipping is inhibited by modifying the gain parameter such that subsequent pulses are less likely to be skipped.”¹⁵ Kotowski discloses that when a level of an output voltage is greater than a threshold voltage, the switched capacitor circuit skips a clock pulse, and when the switched capacitor skips a clock pulse a threshold number of times, the gain is decreased. The gain parameter that is modified, however, is not the minimum gain that is based on the battery voltage, but an actual gain for a switched capacitor circuit. Moreover, while the actual gain may be decreased in an attempt to minimize pulse skipping, decreasing the gain does not necessarily result in the inhibition of pulse skipping by the switched capacitor circuit, as the Office Action asserts.¹⁶ Rather, based on the Kotowski disclosure, it appears that the switched capacitor circuit may continue skipping clock pulses even after the gain is decreased.

Indeed, based on the Kotowski disclosure, it appears that decreasing the gain may result in the same amount of pulse skipping or even an increase in pulse skipping, rather than an inhibition of pulse skipping, as required by Applicant’s claim 1. For example, in Kotowski, when the actual gain reaches the minimum gain, pulse skipping may be increased because the gain cannot be further reduced past the minimum gain. Therefore, any number of consecutive pulse skips will be allowed when the actual gain reaches the minimum gain. In this manner, even

¹³ Kotowski at col. 3, ll. 36–44.

¹⁴ *Id.* at col. 4, ll. 1–3.

¹⁵ Office Action dated 10/16/08 at p. 3, item 5.

¹⁶ *Id.* at p. 6, item 12.

if the “minimum gain” that Kotowski discloses is selected based on the input voltage,¹⁷ the minimum gain may promote pulse skipping rather than inhibit it.

The Office Action asserted that Kotowski discloses that the applied gain of the switched capacitor circuit is decreased when the battery voltage is greater than a threshold voltage.¹⁸ However, Kotowski fails to provide any disclosure to support such an assertion. Kotowski discloses an applied gain setting that is decreased when the output voltage exceeds the desired output voltage a threshold number of times.¹⁹ The gain setting reduction does not necessarily occur when a level of the battery voltage is greater than a threshold voltage. Thus, even if decreasing the applied gain amounts to an inhibition of pulse skipping, an assertion with which Applicant disagrees, Kotowski fails to disclose or suggest inhibiting pulse skipping by a boost converter when a level of the battery voltage is greater than a threshold voltage, as required by Applicant’s claim 1.

The Office Action reasoned that because the output value in Kotowski is the input voltage multiplied by the gain, when the output voltage exceeds a threshold, it necessarily follows that the input voltage exceeds a threshold.²⁰ The Office Action characterized the threshold that the input voltage exceeds as an arbitrary level which causes the appropriate number of “skip” signals required to modify the gain to be generated.²¹ Applicant disagrees with this assertion. An output voltage that exceeds the desired output voltage may simply indicate that the gain setting is too large for the given input voltage. Thus, a reduction in the gain setting of the switched capacitor circuit may merely indicate that the gain setting was too high for the input voltage, thereby resulting in an output voltage that is greater than a desired output voltage. A reduction in a gain setting does not necessarily indicate that the input voltage exceeds a threshold voltage.

The output voltage of the Kotowski switched capacitor circuit does not in any way suggest that the input voltage (i.e., the battery voltage according to the Office Action) is greater than a threshold voltage, as suggested by the Office Action. As discussed above, Kotowski fails to disclose or suggest any particular relationship between the applied gain setting (which is

¹⁷ Kotowski at col. 3, ll. 60-61.

¹⁸ Office Action dated 10/16/08 at p. 6, item 12.

¹⁹ See Kotowski at col. 3, ll. 20-43.

²⁰ Office Action dated 10/16/08 at p. 6, item 12.

²¹ *Id.* at pp. 6-7, item 12.

different than the minimum gain) and the input voltage to the switched capacitor circuit. For at least these reasons, Kotowski fails to inherently disclose a control circuit that is adapted to inhibit pulse skipping by a boost converter when a level of the battery voltage is greater than a threshold voltage.

Kotowski fails to contemplate the programmer of Applicant's claim 1. In Kotowski, if the output voltage of the switched capacitor circuit exceeds a threshold, the switched capacitor skips a clock pulse, which seems generally consistent with a standard pulse skipping operation. In contrast, Applicant's independent claims require the boost converter to inhibit pulse skipping when a level of a battery voltage is greater than a threshold voltage. Whereas Kotowski considers the output voltage for purposes of pulse skipping, the claimed invention considers the battery voltage for purposes of inhibiting pulse skipping.

For at least these reasons, Kotowski does not provide any suggestion of inhibiting pulse skipping when a level of battery voltage is greater than a threshold voltage, as recited by claim 1. Lebel also fails to disclose or suggest the control circuit recited in claim 1. Accordingly, claim 1 is patentable over Kotowski in view of Lebel.

For at least the reasons discussed above with respect to independent claim 1, Kotowski in view of Lebel also fails to disclose or suggest a method that comprises applying a battery voltage to a boost converter to convert the battery voltage to an operating voltage for the programmer and inhibiting pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage, as recited by independent claim 18. In addition, for at least the reasons discussed above with respect to independent claim 1, independent claims 35, 51, 60, 62, and 64 are patentable over Kotowski in view of Lebel.

Additionally, independent claims 60, 62, and 64 further require inhibiting pulse skipping by the boost converter by limiting the level of the battery voltage applied to the boost converter. Dependent claims 13, 30, 46, and 54 also require similar limitations. Kotowski does not disclose or suggest inhibiting pulse skipping by the boost converter by limiting the level of the battery voltage applied to the boost converter.

The Office Action asserted that FIG. 5 of Kotowski discloses the limitations of claims 13, 30, 46, and 54.²² As illustrated in FIG. 3 of Kotowski, the switched capacitor array 310 is a

²² *Id.* at p. 4, item 8.

component of DC-DC converter 300 and an input voltage from a battery is input to the switched capacitor array 310.²³ Kotowski does not disclose or suggest that the level of battery voltage inputted into converter 300 may be limited. Instead, Kotowski discloses that capacitor array 310 within converter 300 merely receives the input voltage from the battery. While Kotowski discloses that the gain of capacitor array 310 within converter 300 may be adjusted, Kotowski does not disclose that the level of battery voltage inputted into converter 300 may be limited. FIG. 5 illustrates another embodiment of a capacitor array, and similarly fails to illustrate that the input voltage V_{in} for the capacitor array may be limited.

Similarly, with respect to dependent claims 4, 21, 38, 63, and 65, Kotowski fails to disclose or suggest a transistor coupled to transmit the battery voltage to the boost converter when the transistor is ON, wherein the transistor turns OFF when the battery voltage exceeds the threshold voltage. In support of the rejection of claims 4, 21, 38, 63, and 65, the Office Action cited switched capacitor array 10 of FIG. 5 of Kotowski.²⁴ As described previously, switched capacitor array 10 is a component of the DC-DC converter and an input voltage from a battery is input to the switched capacitor array. Kotowski does not disclose or suggest that a transistor transmits the battery voltage to the DC-DC converter when the transistor is ON, or that a transistor turns OFF when the battery voltage exceeds the threshold voltage.

Nothing in Kotowski discloses or suggests that the DC-DC converter receives different inputs based on battery voltage, as controlled by switching of a transistor. Instead, Kotowski discloses that a capacitor array 10 within the DC-DC converter merely receives the input voltage from the battery. While Kotowski discloses that the gain of capacitor array 10 within the DC-DC converter may be adjusted, Kotowski does not disclose a transistor coupled to transmit the battery voltage to the DC-DC converter when the transistor is ON, wherein the transistor turns OFF when the battery voltage exceeds the threshold.

Each of claims 6-9, 23-26, and 39-42 depends upon one of claims 4, 21, and 38 and further requires that the transistor transmits the battery voltage, less a drop, to the boost converter when the transistor is OFF. Kotowski fails to disclose or suggest that the DC-DC converter

²³ Kotowski at FIG. 3 and col. 5, ll. 23-28.

²⁴ Office Action dated 10/16/08 at p. 4, item 7.

receives any value other than the battery voltage. Kotowski also fails to disclose or suggest the specific transistor configurations required by claims 6-9, 23-26, and 39-42.

With respect to claims 5, 22, and 61, Kotowski fails to disclose or suggest a comparator to compare the battery voltage to the threshold voltage, wherein an output of the comparator is coupled to a gate of the transistor to turn the transistor ON and OFF based on the comparison. The Office Action stated that it is generally well-known in the electronic arts to utilize comparators to determine when values exceed thresholds and reasoned that it would have been obvious to modify Kotowski by providing a comparator to provide the predictable result of determining when the input value exceeds a threshold with common off-the-shelf parts.²⁵ In the Response to Arguments section, the Office Action also acknowledged that Kotowski does not disclose or suggest comparing the battery voltage to a threshold value.²⁶

Even if it is known to use comparators in the electronics art, an assertion with which Applicant does not necessarily agree, there is no reasonable rationale why one of ordinary skill in the art would have modified Kotowski to include a comparator for the specific application of comparing the battery voltage to a threshold value. Claims 5, 22, and 61 require the threshold voltage to be the same threshold voltage at which pulse skipping by a boost converter is inhibited. As discussed above, Kotowski fails to disclose or suggest inhibiting pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage. The Office Action characterized the claimed threshold voltage as an “arbitrary level which causes the appropriate number of ‘skip’ signals to be generated to modify the gain.”²⁷ It is unclear why one having ordinary skill in the art would have modified Kotowski to include a comparator to compare the battery voltage to an “arbitrary” voltage. The Office Action has failed to provide a rational reason to support such the conclusion of obviousness of claims 5, 22, and 61.

For at least these reasons, the Examiner has failed to establish a *prima facie* case for non-patentability of Applicant’s claims 1–10, 12–27, 29–43, 45–51, and 53–65 under 35 U.S.C. § 103(a). Reconsideration and withdrawal of this rejection is respectfully requested.

²⁵ *Id.* at p. 4–5, item 9.

²⁶ *Id.* at p. 6–7, item 12.

²⁷ *Id.* at p. 7, item 12.

New Claims

Applicant has added claims 66-69 to the pending application. The applied references fail to disclose or suggest the inventions defined by Applicant's new claims, and provide no teaching that would have suggested the desirability of modification to arrive at the claimed inventions. As one example, the references fail to disclose or suggest a comparator that compares the level of the battery voltage to the threshold voltage, whereby the control circuit is adapted to inhibit pulse skipping by the boost converter when the level of the battery voltage is greater than the threshold voltage, as required by claim 66. No new matter has been added by the new claims.

CONCLUSION

All claims in this application are in condition for allowance. Applicant respectfully requests reconsideration and prompt allowance of all pending claims.

In view of the clear distinctions identified above between the current claims and the applied prior art, Applicant reserves further comment at this time regarding any other features of the independent or dependent claims. However, Applicant does not necessarily admit or acquiesce in any of the rejections or the Examiner's interpretations of the applied references. Applicant reserves the right to present additional arguments with respect to any of the independent or dependent claims.

Please charge any additional fees or credit any overpayment to deposit account number 50-1778. The Examiner is invited to telephone the below-signed attorney to discuss this application.

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